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NATIONAL DAM SAFETY PROGRAM. NEW JERSEY NO NAME DAM NUMBER 57 (---ETC(U)
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LEVEL II

DELAWARE RIVER BASIN
TRIBUTARY TO CROSSWICKS CREEK
MONMOUTH COUNTY
NEW JERSEY

N.J. NO NAME DAM
NO. 57
NJ 00826

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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AUG 3 1 1981
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DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

AUGUST 1981

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National Dam Safety Program. New Jersey No Name Dam (NJ00826), Delaware River Basin, Tributary to Crosswicks Creek, Monmouth County, New Jersey. Phase I Inspection Report.

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENT

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		

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11 AUG 1981

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for N.J. No Name No. 57 Dam in Monmouth County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, N.J. No Name No. 57 Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in very poor overall condition. The dam's spillways are considered inadequate because a flow equivalent to 55 percent of the Spillway Design Flood (SDF) would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Investigate the cause of the seepage and wet, soft areas at the downstream toe of the dam.

(2) Design and specify repairs for the erosion of the upstream slope of the dam and design and specify erosion protection for the upstream slope of the dam.

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Honorable Brendan T. Byrne

(3) Design and specify repairs for erosion gullies and animal burrows on downstream slope of dam.

(4) Evaluate the requirements for outlet works and design and construct appropriate outlet works, including a dewatering system.

c. Within thirty days from the date of approval of this report the following remedial measures should be initiated:

(1) Repair of the major erosion gully near the center of the dam which extends from the upstream face to the downstream toe of the dam.

(2) Start a program of checking the condition of the dam daily and monitoring the wet area along the toe of the downstream slope.

d. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Remove the trees and brush and their roots from the entire embankment.

(2) Remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line, whichever is the lesser distance.

(3) Control trespassing on the dam.

(4) Re-establish and maintain grassy vegetation on the dam after repair of eroded areas on the dam.

(5) Clear trees and brush on either side of the emergency spillway discharge channel for 25 feet and downstream for 10 feet or to the property line whichever is the lesser from the spillway crest at the right (west) end of the lake.

e. The owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Howard of the Third District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

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Honorable Brendan T. Byrne

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



ROGER L. BALDWIN

Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

1 Incl

As stated

Copies furnished:

Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 20 April 1981 by Anderson-Nichols and Co. Inc., under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

N.J. No Name No. 57 Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in very poor overall condition. The dam's spillways are considered inadequate because a flow equivalent to 55 percent of the Spillway Design Flood (SDF) would cause the dam to be overtopped. To ensure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within six months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Investigate the cause of the seepage and wet, soft areas at the downstream toe of the dam.

(2) Design and specify repairs for the erosion of the upstream slope of the dam and design and specify erosion protection for the upstream slope of the dam.

(3) Design and specify repairs for erosion gullies and animal burrows on downstream slope of dam.

(4) Evaluate the requirements for outlet works and design and construct appropriate outlet works, including a dewatering system.

c. Within thirty days from the date of approval of this report the following remedial measures should be initiated:

(1) Repair of the major erosion gully near the center of the dam which extends from the upstream face to the downstream toe of the dam.

(2) Start a program of checking the condition of the dam daily and monitoring the wet area along the toe of the downstream slope.

d. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Remove the trees and brush and their roots from the entire embankment.

(2) Remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line, whichever is the lesser distance.

(3) Control trespassing on the dam.

(4) Re-establish and maintain grassy vegetation on the dam after repair of eroded areas on the dam.

(5) Clear trees and brush on either side of the emergency spillway discharge channel for 25 feet and downstream for 10 feet or to the property line whichever is the lesser from the spillway crest at the right (west) end of the lake.

e. The owner of the dam should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

APPROVED:



ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE:

11 Aug 81

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	No Name #57
Identification No.:	Fed ID No. NJ00826
State Located:	New Jersey
County Located:	Monmouth
Stream:	Crosswicks Creek
River Basin:	Delaware
Date of Inspection	April 20, 1981

ASSESSMENT OF GENERAL CONDITIONS

No Name #57 Dam is about a 40-year old earth filled dam and is in very poor overall condition. It is small in size and should be downgraded to significant hazard from its initial classification of high hazard. Trees and brush are growing on both upstream and downstream slopes of the dam. Vehicular trespassing has destroyed some of the ground cover on the crest and erosion has occurred at several locations on both slopes.

An 8-inch corrugated metal pipe leading into at least three lengths of 15-inch reinforced concrete pipe previously served as the principal overflow structure. However, leakage through the joints of the pipes apparently caused the severe erosion in the embankment. A major gully on either side of the pipes has caused the pipes to separate and the headward progress of the gully has reached to within four feet or less of the upstream face of the dam. The upstream opening of the pipe is crushed which essentially blocks discharge through the pipe remnants. A 132-foot emergency spillway adjacent to the right (west) abutment spills into a natural ground channel, passing excess flow away from the dam. This emergency spillway is capable of passing 54 percent of the one-half probable maximum test flood without causing the dam to overtop: it is thus inadequate.

Failure of No Name #57 Dam would probably only cause property damage to Hill Road, which is about 0.7 miles downstream. This road serves as a school bus route; hence if the dam were to breach, a potential loss of life exists because the road would be flooded.

It is recommended that the owner retain the service of a professional engineer, qualified in the design and inspection of dams, to accomplish the following tasks within the specified time frames. Starting immediately: repair the major erosion gully near the center of the dam which extends from the upstream face to the downstream toe of the dam. In the near future: investigate the cause of the seepage and wet, soft

areas at the downstream toe of the dam; remove the trees and brush and their roots from the entire embankment; design or specify repairs for the erosion of the upstream slope of the dam; design and specify erosion protection for the upstream slope of the dam; repair erosion gullies and animal burrows on downstream slope of dam; evaluate the requirements for outlet works; and design and construct appropriate outlet works including a dewatering system. It is further recommended that the owner undertake the following as a part of operating and maintenance procedures. Starting immediately: initiate a program of monitoring the wet area along the toe of the downstream slope; establish a surveillance program for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of emergency conditions. Starting soon: remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line whichever is the lesser distance; control trespassing on the dam; re-establish and maintain grassy vegetation on the dam after repair of eroded areas on the dam; and clear trees and brush on either side of the emergency spillway discharge channel for 25 feet and downstream for 10 feet or to the property line whichever is the lesser from the spillway crest at the right (west) end of the lake. In the near future: develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.



Warren A. Guinan, P.E.

Project Manager

New Jersey No. 16848



OVERVIEW

NO NAME #57 DAM

20 April 1981

CONTENTS

PHASE I INSPECTION REPORT NATIONAL DAM SAFETY REPORT

NO. NAME #57 DAM FED ID NO. NJ00826

SECTION 1	PROJECT INFORMATION	<u>Page</u>
	1.1 <u>General</u>	1
	1.2 <u>Project Description</u>	1
	1.3 <u>Pertinent Data</u>	3
SECTION 2	ENGINEERING DATA	
	2.1 <u>Design</u>	6
	2.2 <u>Construction</u>	6
	2.3 <u>Operation</u>	6
	2.4 <u>Evaluation</u>	6
SECTION 3	VISUAL INSPECTION	7
SECTION 4	OPERATIONAL PROCEDURES	
	4.1 <u>Procedures</u>	9
	4.2 <u>Maintenance of Dam</u>	9
	4.3 <u>Maintenance of Operating Facilities</u>	9
	4.4 <u>Warning System</u>	9
	4.5 <u>Evaluation of Operational Adequacy</u>	9
SECTION 5	HYDRAULIC/HYDROLOGIC	10
SECTION 6	STRUCTURAL STABILITY	11
SECTION 7	ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES	
	7.1 <u>Assessment</u>	12
	7.2 <u>Recommendations/Remedial Measures</u>	12
FIGURES	1. Essential Project Features	
	2. Regional Vicinity Map	
APPENDICES	1. Check List Visual Inspection	
	2. Photographs	
	3. Hydrologic Computations	
	4. HEC 1 Output	
	5. References	

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
NO NAME #57
FED ID NO. #NJ00826

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of No Name #57 Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 December 1980 under Basic Contract No. FPM-39, and Contract No. A01093 dated 10 October, 1979. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the U.S. Army Engineer District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc.

b. Purpose: The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to the safety of No Name #57 Dam and appurtenances. Conclusions are based upon available data and visual inspection. The results of this study are used to determine any need for emergency measures and to conclude if additional studies, investigations, and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. No Name #57 (locally known as Ed's Pond, or Rette's Pond Dam) is an earth embankment dam 15.5 feet high, 618 feet long with a 13-foot wide crest. The upstream embankments have 2H:1V slopes that are tree covered. The principal overflow area is an 8-inch corrugated metal pipe (CMP), located approximately 286' from the left abutment. This pipe appears to extend from the upstream face through the embankment and into a 15-inch reinforced concrete pipe (RCP). The 8-inch pipe is plugged and is inoperable. An earthen emergency spillway is located approximately 486 feet from the left abutment and is about 132 feet across to the right overbank. On the day of the inspection, the emergency spillway area was overgrown with trees and brush with no water flowing over the spillway.

b. Location. The dam is located in Upper Freehold Township, New Jersey on a tributary to Crosswicks Creek. The dam is at 40° 08.5' north latitude 74° 33.1' west longitude on the Allentown Quadrangle. The dam can be reached by taking

Exit 6 on Interstate 195 and following New Jersey 539 South. This secondary state road becomes Main Street through Allentown, then veers left as High Street, and continues as Allentown-Davis Station Road. Access to the dam is obtained by stopping on Allentown-Davis Station Road at Holmes Mill. Inquiries must be made of the farm manager, Ernest Farnza, to reach the dam site. A location map has been included as Figure 2.

c. Size Classification. No Name #57 Dam is classified as being small in size on the basis of storage at the dam crest of 112 acre-feet, which is less than 1000 acre-feet but more than 50 acre-feet, and on the basis of its structural height of 16.6 feet, which is less than 40 feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Visual inspection of No Name #57 Dam revealed a significant erosional gully in the vicinity of the principal (pipe) spillway. A breach of the dam through this gully is likely to flood Hill Road, a school bus route, located about 0.7 miles downstream of the dam. Based on the poor condition of the dam and the potential loss of life on Hill Road, No Name #57 Dam is classified as significant hazard.

e. Ownership. The dam is owned by the Newark Boxboard Company, 57 Freeman Street, Newark, New Jersey. Mr. Edward K. Mullen is the President and Owner of Newark Boxboard and may be reached at the above address.

f. Purpose. No Name #57 Dam was alledged to have been originally built for irrigation but it is now only used for recreational purposes.

g. Design and Construction History. No information regarding the original plan or design of the dam was available. However, the age of the dam is estimated to be about 40 years or more from the size of the largest trees on the downstream slope. The presence of skeleton trunks and stumps in the reservoir's upper end suggest that the dam may have been raised about 6 feet in the past to its present height.

h. Normal Operational Procedure. No operational procedures exist for the dam.

i. Site Geology. No site specific geologic information (such as borings) was available at the time the dam was inspected. Information derived from the Geologic Map of New Jersey (Kummel and Johnson, 1912) and Pre-Quaternary Geology of the Allentown Quadrangle (Owens and Menard, 1966) indicates soils within the immediate site consist of coastal plain sediments which include massive bedded silty fine sands and silts which are occasionally gravelly.

The depth to bedrock at the dam site is unknown and outcrops were not observed during the dam inspection. No information was available on the bedrock in this area based on the previously-mentioned reports.

1.3 Pertinent Data

a. Drainage Area

0.2 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - unknown

Total ungated spillway capacity at maximum pool elevation - 235

c. Elevation (ft. above NGVD)

Top of dam - 73.1

Maximum pool test flood (1/2 PMF) - 73.4

Recreation pool (at time of inspection) - 70

Spillway crest - 70.1 (estimated invert elev. of
8-inch CMP)
- 72.3 (emergency spillway)

Streambed at centerline of spillway - 57.6 (toe of dam
below 8-inch CMP)

Maximum tailwater (estimated) at emergency
spillway - 68.7

d. Reservoir Length at: (in feet)

Maximum pool - 1300 (estimated)

Spillway crest - 1200

e. Storage (acre-feet)

Spillway crest - 102

Top of dam - 112

Test flood (1/2 PMF) 120

f. Reservoir Surface (acres)

Top of dam - 15.1

Emergency spillway crest - 12.8

g. Dam

Type - earthfill

Length - 618 feet

Height - 15.5 feet (hydraulic)

- 16.6 feet (structural)

Top width - 4-13 feet

Side slopes - upstream 2H:1V, downstream 2H:1V

Zoning - unknown

Impervious core - unknown

Cutoff - unknown

Grout curtain - unknown

h. Principal Spillway

Type - One 8-inch diameter CMP leads into a 15-inch RCP (not presently operable)

Length of weir - not applicable

Crest elevation - 70.1 feet NGVD (estimated for 8-inch CMP invert)

Low level outlet - none

U/S Channel - Reservoir

D/S Channel - Tributary to Crosswicks Creek

i. Emergency Spillway

Type - earthen with irregular crest

Length (of weir) - 132'

Crest elevation - 72.3 (low point of spillway crest)

Gates - none

U/S Channel - Reservoir

D/S Channel - Tributary to Crosswicks Creek

SECTION 2 ENGINEERING DATA

2.1 Design

No original plans, hydraulic or hydrologic data for No Name #57 Dam were found.

2.2 Construction

No data concerning the original construction of No Name #57 Dam were disclosed.

2.3 Operation

No engineering operational data were available.

2.4 Evaluation

- a. Availability. A search of the New Jersey Department of Environmental Protection files and contact with representatives of the owner of the dam revealed very limited oral information. All available information was retrieved.
- b. Adequacy. Recorded information was inadequate; evaluation was based primarily on visual observations and measurements, which were adequate for this study.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. Trees are growing on the crest of the dam, on the downstream slope, and in the area at the downstream toe of the dam. Extensive erosion has taken place on the upstream slope at and above the waterline. Roots of trees were observed extending from the downstream edge of the crest to the upstream slope.

The crest of the dam is partially covered with grass with depression tracks caused by vehicular traffic up to 8 inches deep. Near the center of the dam, a large erosion gully has developed in the vicinity of the 15-inch reinforced concrete pipe which has caused the concrete pipe to collapse within the confines of the gully except for the upstream section which is connected to an 8-inch corrugated metal pipe that passes into the dam crest. The gully varies in width up to 8 feet and extends in depth from 5 to 8 feet. The erosion gully has extended to within 3 to 4 feet of the waterline on the upstream face. The inlet to the 8-inch corrugated metal pipe is buried in sediment. The area at the downstream toe of the dam is generally wet and soft and some seepage water is discharging. The visible water contains numerous orange-colored flocs but no evidence of suspended soil fines in the water was observed.

Some animal burrows and numerous small erosion gullies were observed on the downstream slope.

b. Appurtenant Structures. (a) The entrance to the ungated emergency spillway is clogged with fallen logs and debris. Several pieces of concrete were observed on the bottom of the discharge channel which may be, in fact, the remnant of a concrete apron. (b) The entrance to the principal outlet work is plugged with debris. The 8-inch CMP and outlet pipe is badly rusted, and the pieces of 15-inch RCP are badly displaced because of erosion of the embankment. The cement block head wall is crushed and tilted with approximately one block visible.

c. Reservoir Area. The watershed above the lake is gently to moderately sloping and wooded. Some open fields exist along the left side of the reservoir. Slopes on the shore of the lake appear stable. No evidence of significant sedimentation was observed. The large number of tree trunks and stumps in the upper part of the reservoir indicate that the reservoir may have been smaller in volume and surface area. Probably the dam was added to or raised to increase the volume and water level.

d. Downstream Channel. No well defined channel was noted below the principal (pipe) overflow outlet. A seepage area was noted and a thread trace from discharges in the past linked up about 250 feet downstream with the emergency spillway retreat channel. Considerable erosion has occurred on the right and left banks of the channel immediately downstream of the emergency spillway for a distance of approximately 100 ft. Two hundred feet downstream of the emergency spillway, stream flow in the channel has caused a large erosion gully to form with a vertical face up to 7 feet high. Trees are growing on the banks of the channel downstream of the emergency spillway.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were revealed.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were found.

4.3 Maintenance of Operating Facilities

No formal maintenance procedures for the operating facilities were discovered.

4.4 Warning System

No description of any warning system was found.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures, the remedial measures described in Section 7.2 should be implemented as described.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Because no data were revealed, an evaluation of recorded hydrologic and hydraulic data could not be performed.

b. Experience Data. No experience data were found.

c. Visual Observation. The primary spillway for No Name #57 Dam, consisting of an 8-inch CMP, appears to have been connected by slip joints to a 15-inch RCP. The joints appear not to have been previously water-tight and allowed water to leak into the embankment, causing extensive erosion. The upstream end of the 8-inch CMP is crushed and covered with fill.

d. No Name #57 Dam Overtopping Potential. The hydraulic/hydrologic evaluation for the dam is based on a selected Spillway Design Flood (SDF) equal to one-half the Probable Maximum Flood (PMF) in accordance with the range of test floods given in the evaluation guidelines, for dams classified as significant hazard and small in size. The PMF was determined by application of a 24-hour Probable Maximum Storm (PMS) of 23.2 inches to the SCS dimensionless unit hydrograph. Hydrologic computations are given in Appendix 3. The routed half-PMF peak discharge for the subject drainage area is 520 cfs.

Water will rise to a depth of 0.8 foot above the emergency spillway crest before overtopping the low point on the dam embankment crest. Under this head the emergency spillway capacity is 235 cfs, which is less than the selected SDF.

Flood routing calculations indicate that No. Name #57 Dam will be overtopped for 1.5 hours to a maximum depth of 0.3 foot under half-PMF conditions. It is estimated that the emergency spillway can pass about 54 percent of the one-half PMF without overtopping the dam; thus, the spillway is considered inadequate.

Because of the poor condition of the dam and the possible loss of life on Hill Road, a breach analysis was performed to assess the increase in downstream hazard under dam failure conditions. The results of the breach analysis, contained in Appendix 4, show that the downstream hazard is significantly increased under dam failure conditions.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The soft, wet area and seepage at the downstream toe of the dam is indicative of seepage through and under the dam which, if not properly controlled, could lead to failure of the dam by piping or sloughing of the downstream slope. Serious erosion in the gully adjacent to the 8-inch CMP and 15-inch RCP and erosion of the upstream slope of the dam at the waterline, if allowed to continue, could result in eventual breaching of the embankment. Parts of the crest of the dam which are bare of vegetation would be susceptible to erosion if the dam were overtopped, which might, in turn, lead to breaching of the dam. Trees growing on the crest and downstream slope and brush which may eventually attain tree size on both the downstream and upstream slopes may cause seepage and erosion problems if a tree blows over and pulls out its roots, or if a tree dies or is cut and its roots rot. Small erosion gullies, which are bare of vegetation, on the downstream slope are susceptible to erosion by rainfall or by overtopping of the dam, and the erosion could, in turn, lead to breaching of the dam.

6.2 Design and Construction Data. No design or construction data pertinent to the structural stability of the dam are available.

6.3 Operating Records. No operating records pertinent to the structural stability of the dam were available.

6.4 Post-Construction Changes

No record of post-construction changes was available.

6.5 Seismic Stability - This dam is in Seismic Zone 1. According to the Recommended Guidelines, dams located in Seismic Zone 1 "may be assumed to present no hazard from earthquake, provided static stability conditions are satisfactory and conventional safety margins exist". None of the visual observations made during the inspection are indicative of unstable slopes. However, because no data are available concerning the engineering properties of the embankment and foundation materials for this dam, it is not possible to make an engineering evaluation of the stability of the slopes or the factor of safety under static conditions. It is not recommended that a stability analysis be done.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. No Name No. 57 is estimated to be about 40 or more years old based on the size of trees on the downstream face, and is in very poor condition.

b. Adequacy of Information. The information available is such that the assessment of the dam must be based entirely on the results of the visual inspection.

c. Urgency. The recommendations made in 7.2.a and 7.2.b should be implemented by the owner as prescribed.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are listed in 7.2.a. These problems require the attention of a professional engineer who will have to make additional engineering studies to design or specify remedial measures to rectify the problems. If left unattended, the problems could lead to failure of the dam.

7.2 Recommendation/Remedial Measures

a. Recommendations

The owner should retain a professional engineer qualified in the design and construction of dams to design a complete rehabilitation of the existing dam, including the following:

Starting immediately:

Repair of the major erosion gully near the center of the dam which extends from the upstream face to the downstream toe of the dam.

In the near future:

1. Investigate the cause of the seepage and wet, soft areas at the downstream toe of the dam.
2. Remove the trees and brush and their roots from the entire embankment.
3. Design and specify repairs for the erosion of the upstream slope of the dam and design and specify erosion protection for the upstream slope of the dam.

4. Design and specify repairs for erosion gullies and animal burrows on downstream slope of dam.
5. Evaluate the requirements for outlet works and design and construct appropriate outlet works, including a dewatering system.

b. Operating and Maintenance Procedures

The owner should do the following immediately:

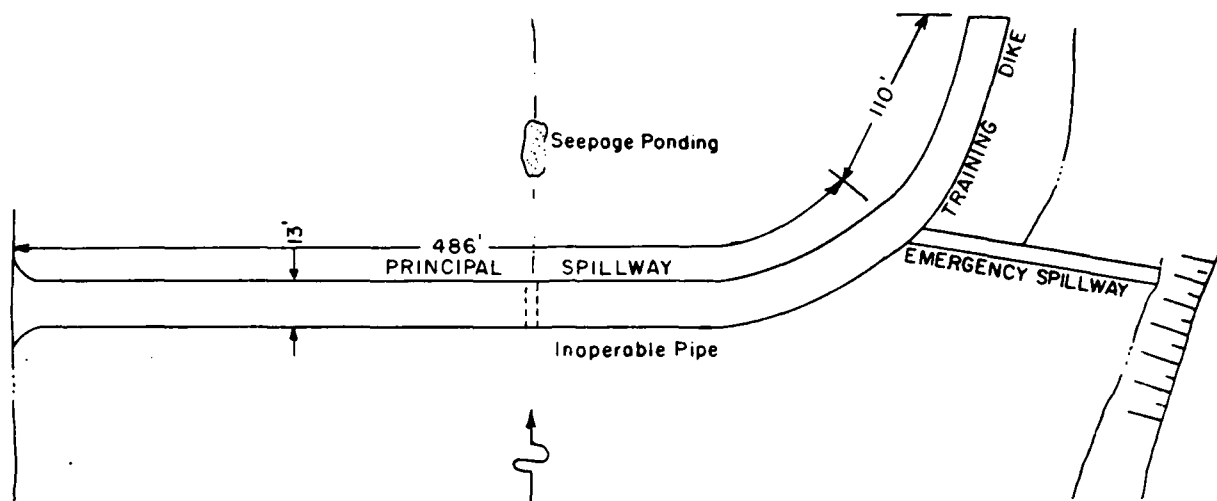
- (1) Start a program of checking the condition of the dam daily and monitoring the wet area along the toe of the downstream slope.
- (2) Establish a surveillance program for use during and immediately following periods of heavy rainfall and also a warning program to follow in case of emergency conditions.

The owner should do the following soon:

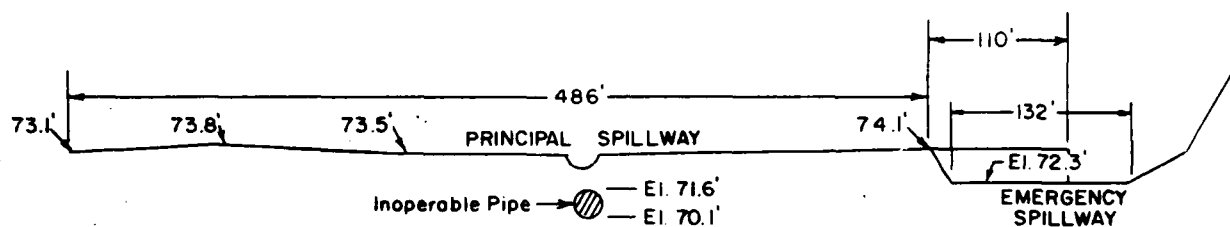
- (1) Remove trees and brush for a distance of 25 feet downstream from the toe of the dam or to the property line, whichever is the lesser distance.
- (2) Control trespassing on the dam.
- (3) Re-establish and maintain grassy vegetation on the dam after repair of eroded areas on the dam.
- (4) Clear trees and brush on either side of the emergency spillway discharge channel for 25 feet and downstream for 10 feet or to the property line whichever is the lesser from the spillway crest at the right (west) end of the lake.

The owner should accomplish the following in the near future:

Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.



PLAN VIEW



— 57.6' —
TOE OF SLOPE DOWNSTREAM SIDE

PROFILE

Anderson-Nichols & Co., Inc.		U.S. ARMY ENGINEER DIST. PHILADELPHIA	
BOSTON		CORPS OF ENGINEERS	
MASSACHUSETTS		PHILADELPHIA, PA	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
NO NAME DAM No. 57			
TRIBUTARY TO CROSSWICKS CREEK		NEW JERSEY	
		SCALE NOT TO SCALE	
		DATE MAY 1981	

FIGURE 1



SCALE IN MILES



MAP BASED ON STATE OF NEW JERSEY
OFFICIAL MAP & GUIDE.

Anderson-Nichols & Co., Inc.		U.S. ARMY ENGINEER DIST. PHILADELPHIA	
BOSTON		MASSACHUSETTS	
CORPS OF ENGINEERS		PHILADELPHIA, PA.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
NO NAME DAM No.57			
LOCATION MAP			
TRIBUTARY TO CROSSWICKS CREEK		NEW JERSEY	
		SCALE: 1" = 4 Miles Approx.	
		DATE: MAY 1981	

FIGURE 2

APPENDIX 1
CHECK LIST
VISUAL INSPECTION

NO NAME #57 DAM

Check List
Visual Inspection
Phase 1

Name Dam No Name Dam No. 57 County Monmouth State NJ (00826) Coordinators NJDEP
 (NJ 00826) 2/18/81 Sunny 70°
 Date(s) Inspection 4/20/81 Weather Overcast Temperature 45°
 Pool Elevation at Time of Inspection 72.3 NGVD Tailwater at Time of Inspection None NGVD

Inspection Personnel:

Warren Guinan

Steve Gilman

Richard Murdock

Richard Murdock/Steve Gilman Recorder

The inspection team was accompanied by Ernest Farnza,
farm manager.

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Cement block headwall 2 ft x 2 ft + cracked and tilted. 8-in CMP - Rusted - 15-in RCP OK but badly displaced.	Major reconstruction required.
INTAKE STRUCTURE	Cement block headwall cracked and tilted.	
OUTLET PIPE	8-in CMP Badly Rusted 15-in RCP - Fair - Badly displaced.	
OUTLET CHANNEL	Badly eroded. Extensive brush and moisture loving vegetation.	Clean debris from channel. Cut trees and brush both in channel and 25 ft on either side of channel for a distance of 100 ft d/s of toe or to the property line, whichever is the lesser.
EMERGENCY GATE	None Observed.	

EMERGENCY PILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	No concrete Weir - Natural earth spillway weir crest is irregular and covered with brush - Minor erosion adjacent to training dike.	Repair erosion and general repair to prevent further erosion of weir crest.
APPROACH CHANNEL	Under water, upstream face of dam.	
DISCHARGE CHANNEL	Natural earth channel, numerous trees both in the channel and on either side of channel. Large erosion gully observed approximately 200 ft downstream of spillway approach channel.	Clear trees and brush from downstream channel for a distance of 25ft on either side of the channel and for a distance of 100 ft downstream of dam or to the property line, whichever is the lesser.
BRIDGE AND PIERS OVER SPILLWAY	None	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ADJACENT SLOPES	Extensive erosion of both upstream and downstream face, major erosion adjacent to outlet pipe near center of dam.	Major repair of erosion gully near center of dam required as soon as possible. Provide adequate erosion protection.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal alignment good. Vertical alignment is uneven. Slight undulating of crest elevation. Tire tracks up to 8 in. deep along the crest.	
RIPRAP FAILURES	No riprap observed, small trees growing on upstream face.	Remove trees and brush and provide adequate erosion protection on upstream slope.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	None observed.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Erosion observed at downstream toe of training dike adjacent to spillway channel.	
ANY NOTICEABLE SEEPAGE	Area downstream of toe of dam is generally soft and wet.	
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed.	

INSTRUMENTATION

VISUAL EXAMINATION NONUMENTATION/SURVEYS	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	None observed. t	
OBSERVATION WELLS	None observed.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	
OTHER	None observed.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle to steeply sloping. Mostly wooded. Some open fields along left side of reservoir.	
SEDIMENTATION	No evidence of significant sedimentation observed.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Meandering channel with fallen trees, extensive brush and moisture-loving vegetation.	Clear debris from channel. Cut trees and brush both in channel and 25 ft on either side of channel for a distance of 100 ft downstream of dam or to the property line, whichever is the lesser.

SLOPES
Tree and brush covered mild slopes on
both right and left downstream banks.

APPROXIMATE NO.
OF HOMES AND
POPULATION
None

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	None found
REGIONAL VICINITY MAP	Prepared for this report
CONSTRUCTION HISTORY	None found
TYPICAL SECTIONS OF DAM	None
HYDROLOGIC/HYDRAULIC DATA	None
OUTLETS - PLAN	None found
- DETAILS	None found
- CONSTRAINTS	None found
- DISCHARGE RATINGS	None found

RAINFALL/RESERVOIR RECORDS None found

ITEM	REMARKS
DESIGN REPORTS	None found
GEOLOGY REPORTS	None found
DESIGN COMPUTATIONS	
HYDROLOGY & HYDRAULICS	None found
DAM STABILITY	
SEEPAGE STUDIES	
MATERIALS INVESTIGATIONS	
BORING RECORDS	None found
LABORATORY	
FIELD	
POST-CONSTRUCTION SURVEYS OF DAM	None found
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	None
HIGH POOL RECORDS	None
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	None

ITEMS	REMARKS
SPILLWAY PLAN	
SECTIONS	Prepared for this report from field inspection
DETAILS	None
OPERATING EQUIPMENT PLANS & DETAILS	None None

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.2 square miles, gentle slope,
pastures and woods, suburban.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 72.3' NGVD (102 acre-
feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY) Not applicable

ELEVATION MAXIMUM TEST FLOOD POOL: 73.4' NGVD

ELEVATION TOP DAM: 73.1' NGVD

PRINCIPAL SPILLWAY CREST: 8-inch corrugated metal pipe (CMP)
inoperable

a. Elevation 70.6' NGVD

b. Type Pipe

c. Width 8-inch CMP

d. Length Not applicable

e. Location Spillover Left-center of dam

f. Number and Type of Gates None

EMERGENCY SPILLWAY CREST: Free overflow earthen spillway

a. Elevation 72.3' NGVD

b. Type Earthen

c. Width 10 feet

d. Length 132 feet

e. Location Spillover Right of the dam

f. Number and Type of Gates None

OUTLET WORKS: None

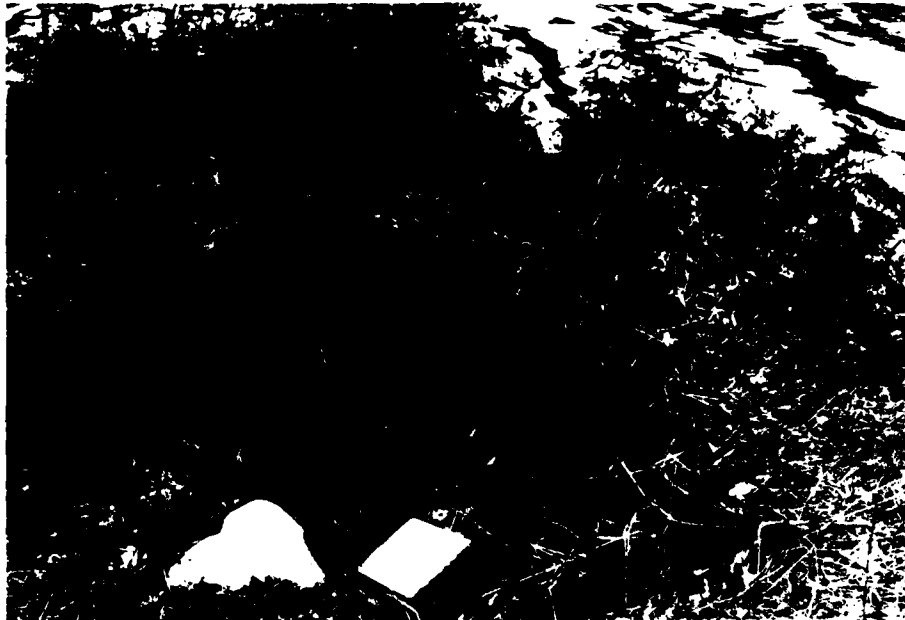
HYDROMETEOROLOGICAL GAGES: None

MAXIMUM NON-DAMAGING DISCHARGE: 235 cfs

APPENDIX 2

PHOTOGRAPHS

NO NAME #57 DAM



April 20, 1981

View of junction of primary spillway 8-in CMP and 15-in RCP.
Clipboard approximately 6 ft downstream from waterline,
3-ft-deep depression.



April 20, 1981

View along major erosion feature on crest of dam looking
downstream.



April 20, 1981

View of large erosion feature in vicinity of 8-in diameter CMP.
Vertical drop approximately 3 ft at first junction of pipe.



February 18, 1981

View looking from right (west) side across emergency spillway.
Channel is downstream approximately below level tripod.



April 20, 1981

View looking downstream at the emergency retreat channel.



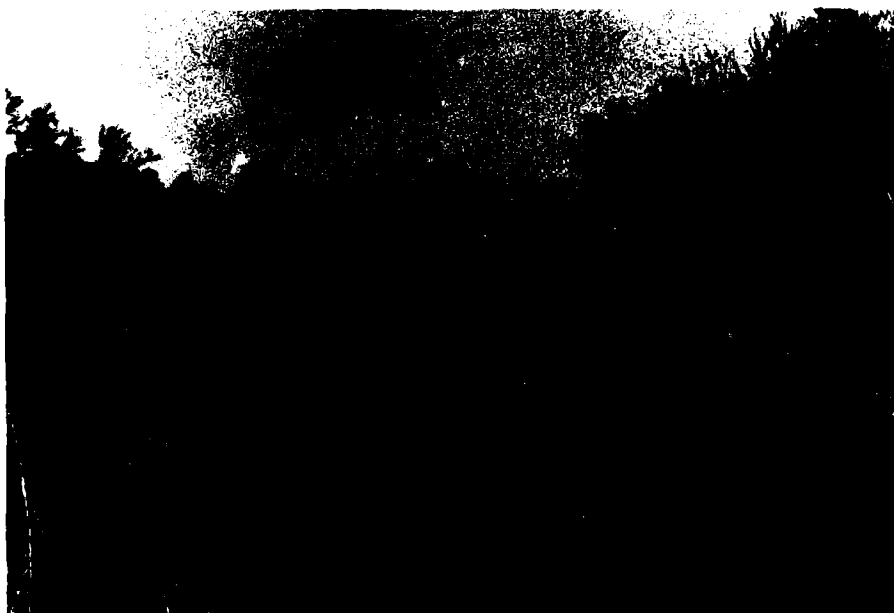
April 20, 1981

View looking upstream at emergency spillway escarpment approximately 200 ft downstream of dam.



February 18, 1981

View looking eastward across reservoir toward horse barn in distance from right bank at end of emergency spillway.



February 18, 1981

View looking northward across reservoir from dam crest near center of dam.



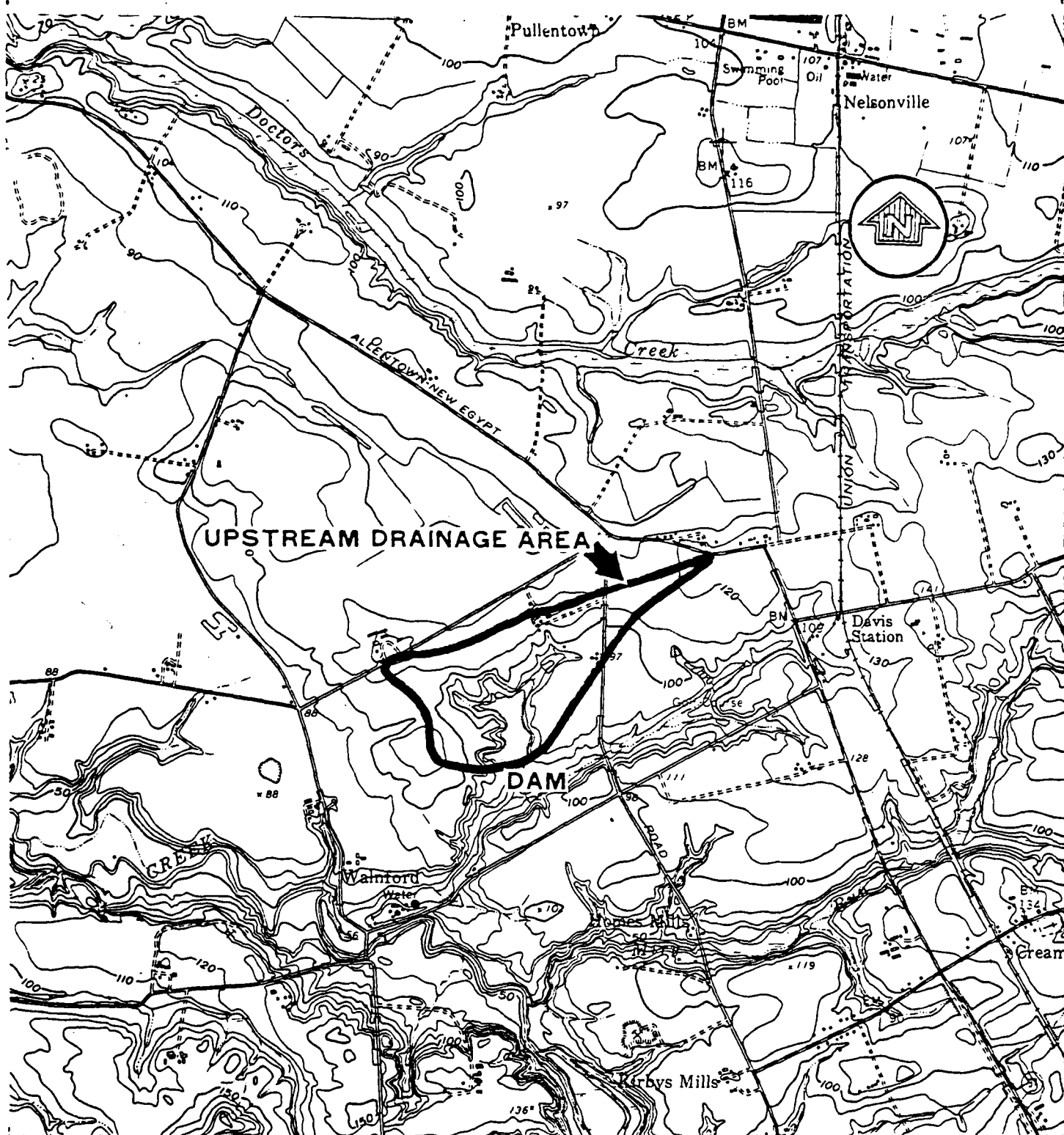
April 20, 1981

View of two 10-in diameter animal burrows approximately
3 ft down from crest near left (east) side of dam.

APPENDIX 3

HYDROLOGIC COMPUTATIONS

NO NAME #57 DAM



**NATIONAL PROGRAM OF INSPECTION OF
NON-FED. DAMS**

**NO NAME DAM No. 57
UPPER FREEHOLD TOWNSHIP, NEW JERSEY
REGIONAL VICINITY MAP**

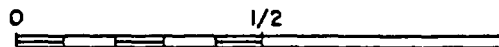
MAY 1981

**DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA**

Anderson-Nichols & Company, Inc.

BOSTON, MA.

SCALE IN MILES



**MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE
SHEET ALLENTOWN, N.J. 1957, REVISED 1970.**

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

TIME OF CONCENTRATION

① Texas Highway Method

overland

reach length 2400

slope $\frac{125-90}{2400} = .015$ average velocity = 1.5 fps
for pastureschannel

reach length 2200'

slope $\frac{90-70}{2000} = .01$

avg vel. 2 ft/sec

$$\frac{2400}{1.5} + \frac{2200}{2.0} = 2700 \text{ sec} = 45 \text{ min} = \underline{\underline{.75 \text{ hrs.}}}$$

② Soil & Water Conservation

$$L = 0.6 T_c \quad L = \frac{l^{0.8} (S+1)^{1.67}}{9000 y^{0.5}}$$

$$S = \frac{1000}{CN} - 10$$

$$l = 2400 + 2200 = 4600$$

$$y = \frac{125-70}{4600} = .012 = 1.2\%$$

CN = 74 for pastures

$$S = \frac{1000}{74} - 10 = 3.5$$

$$L = \frac{(4600)^{0.8} (3.5+1)^{1.67}}{9000 (1.2)^{0.5}} = 1.06$$

$$T_c = \frac{1.06}{.6} = \underline{\underline{1.8 \text{ hrs.}}}$$

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

③ Weston or overland SCS Tr # 55

$$l = 2400$$

$$\text{slope} = .015 \text{ (see method 1)}$$

flow is mostly through pasture
from TR-55 graph $C_v = 0.9 \text{ ft/sec}$

$$\frac{2400}{0.9} = 2667 \text{ sec} = \underline{0.74 \text{ hrs.}}$$

channelestimate rectangular channel/
for Manning's formula

$$1' \times 10' \quad A = 10 \text{ ft}^2 \quad R = \frac{A}{W_p} = \frac{10}{2(1) + 10} = .83 \text{ ft}^2$$

$$V = \frac{1.49}{.035} (.83)^{2/3} (.01)^{1/2} = 3.8 \text{ ft/sec}$$

$$n = 0.035$$

$$S = .01$$

$$l = 2200'$$

$$\frac{2200}{3.8} = 579 \text{ sec} = \underline{.16 \text{ hrs.}}$$

$$.74 + .16 = \underline{.90 \text{ hrs.}}$$

④ Kirby

$$\text{overland} \quad T_c = 0.83 \left(\frac{Nl}{\sqrt{S}} \right)^{0.467}$$

$$N = 0.4 \quad S = 0.015 \quad l = 2400$$

$$T_c = 0.83 \left(\frac{0.4(2400)}{\sqrt{0.015}} \right)^{0.467} = 54.7 \text{ min} = .91 \text{ hrs.}$$

$$\text{channel} \quad S = .01 \quad n = 0.035 \quad R = 0.83 \quad V = 3.8 \text{ ft/sec.}$$

$$l = 2200' \quad \frac{2200 \text{ ft}}{3.8 \text{ ft/sec}} = 579 \text{ sec} = \underline{.16 \text{ hrs.}}$$

$$.91 + .16 = \underline{1.07 \text{ hrs.}}$$

Anderson-Nichols & Company, Inc.

Subject W.C. NICHOLS #57

Sheet No. 3 of 11
Date 9/1/61
Computed SM/CAP
Checked BS

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

1

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10

11

12

13

14

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40

AVERAGE T_C FROM THE FOUR MINUTES

$$T_C = \frac{.75 + 1.8 + .90 + 1.07}{4} = \underline{1.13 \text{ hrs.}}$$

$$T_{LIG} = (.6)(1.13) = \underline{.68 \text{ hrs.}}$$

JOB NO.

SQUARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
14 SCALEStankowski Equation

$$Q_{100} = A^{0.84} S^{0.26} S_t^{-0.51} I^{0.14}$$

$$A = 0.2 \text{ mi}^2$$

$$S = \frac{115 - 90 \text{ ft}}{.4 \text{ mi}} = 50 \text{ ft/mi}$$

$$S_t = \frac{12.8 \text{ acres of pond}}{128 \text{ acres of da}} = 10\% + 1\% = 11\%$$

$$I = .117 D^{0.742 - 0.039 \log D}$$

$$D = \frac{4 \text{ houses} \times 3 \text{ people}}{0.2 \text{ mi}^2} = 60$$

$$I = .117 (60)^{0.742 - 0.039 \log(60)} = 2\%$$

$$Q_{100} = 136 (.2)^{.84} (50)^{.26} (11)^{-.51} (2)^{.14} = \underline{32 \text{ cfs}}$$

Spillway capacity for earthen
emergency spillway is 235 cfs
from Rating Curve

**** primary spillway is a blocked pipe ****

**** Decided to use 1/2 PMP because of poor
condition of dam + the small flow
route downstream.**

2100

2000

2000

4100

Emergency Spillway

Principal Spillway

Top of
Plugged Overhead
Pipe 71.6
Bottom 70.1

Profile

80'

70'

74.1 1459
74.0 1432
72.3 1432
72.3 0.0
71.6 0.0

73.1 4186
73.8 4400
72.5 3700

ANDERSON-NICHOLS

VERNON BOSTON CONCORD

NO Name #57

DATE 5/7/81 SCALE: JOB NO. 3671-10 SHEET NO. 5 OF 11

CRP

JOB NO.

SQUARES
1/4 IN SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

DEVELOPMENT OF RATING CURVE

① SPILLWAY CURVE

A. COMPUTE Q USING WEIR FLOW EQUATION $Q = CLH^{3/2}$

WEIR COEFFICIENT 2.49

WEIR LENGTH 132

BREATH ASSUME 10'

② TOP OF DAM

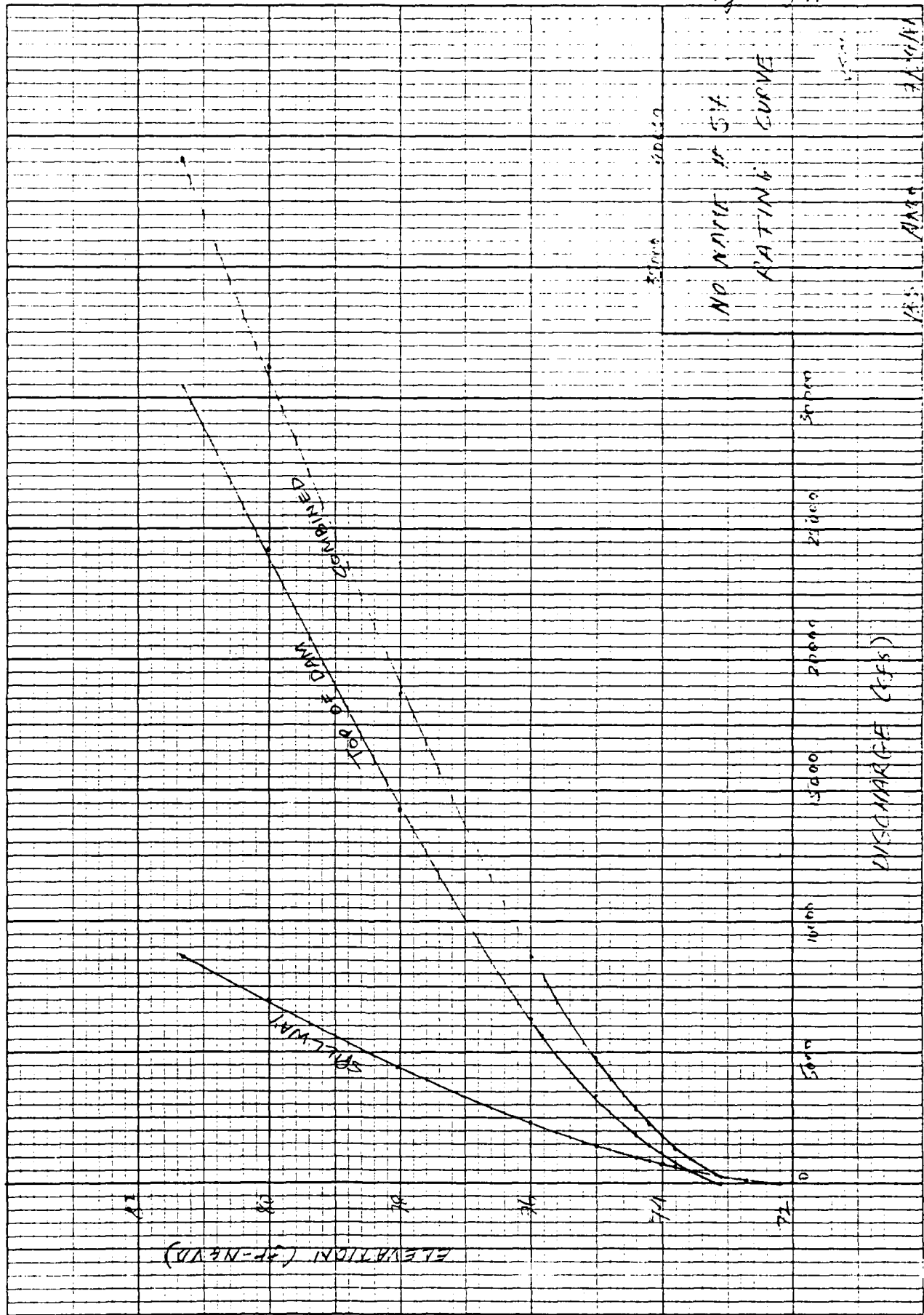
A. COMPUTE Q USING WEIR FLOW EQUATION
($Q = CLH^{3/2}$)

3 WEIR COEFFICIENT 2.6

WEIR LENGTH 486

ELEVATION	SPILLWAY HEAD	CFS	TOP OF DAM HEAD	LENGTH	Q CFS	COMBINED Q (CFS)
Spillway 72.3	0	0				
73.7	.4	83				83
Top dam 73.1	.8	235	0	0	0	235
73.8	1.5	604	.7	486	740	1344
74	1.7	729	.9	486	1079	1808
74.2	1.9	861	1.1	486	1453	2319
74.4	2.1	1000	1.3	486	1873	2873
75	2.7	1458	1.9	486	3310	4768
76	3.7	2339	2.9	488	6266	8605
79	5.7	4473	4.9	506	14270	18743
80	7.7	7023	6.9	513	24175	31198
81.1	8.8	8580	8	518	30474	39055

Fig 7 CH11



NO. 10000 10 5%
RATING CURVE

DISCHARGE (CFS)

10000 10 5%
RATING CURVE

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

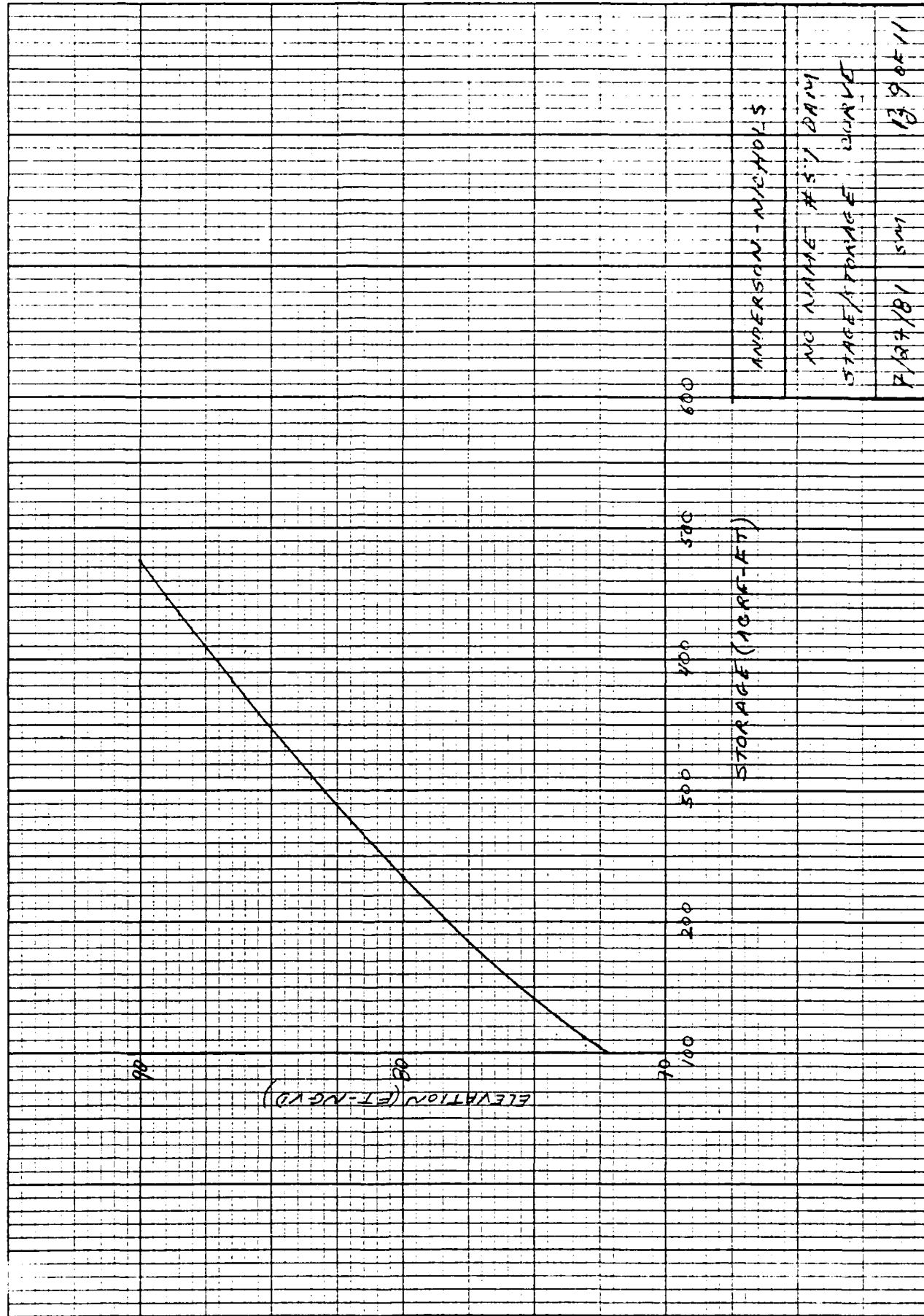
STAGE STORAGE DETERMINATIONS
ASSUME DEPTH OF 8

ELEVATION	SURFACE AREA ACRES	AVG SA. ACRES	INCREMENTAL STORAGE AC.FT	CUMULATIVE STORAGE AC.FT
		12.8	102.4	
72.2	12.8			102.4
		17.3	133.2	
80	21.8			235.6
		24.2	242.6	
90	29.2			477.6
		52.1	521.	
100	75.0			998.6

INPUT FOR HEL I (FROM CURVE)

	STAGE	STORAGE
	57.6	0
Emergency Spillway	70.3	102
Top dam	73.1	112
	74.2	128
	80	236
	90	478
	100	999

8" pipe at main spillway @ invert 70.1' is plugged



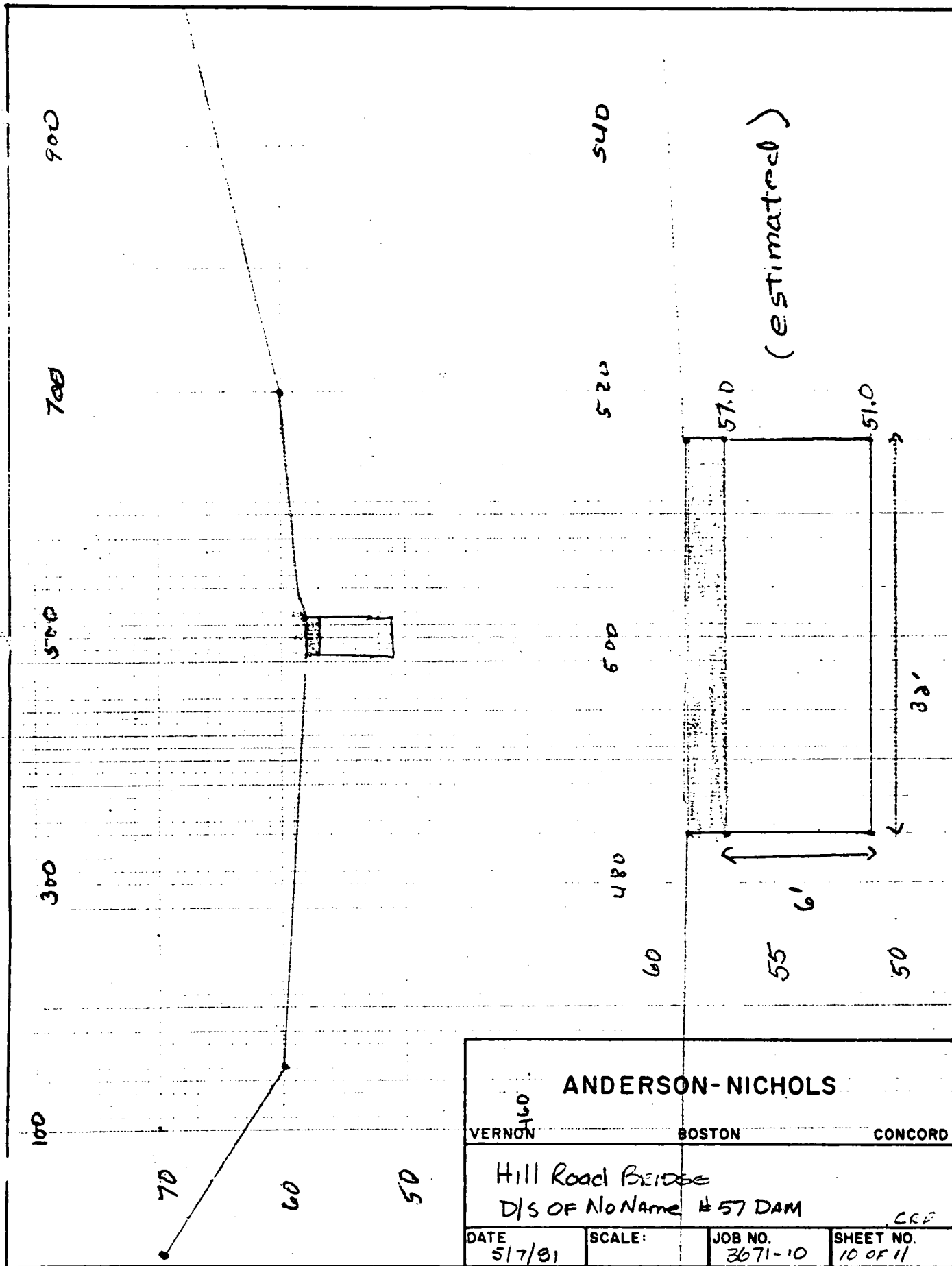
ANDERSON - NICHOLS

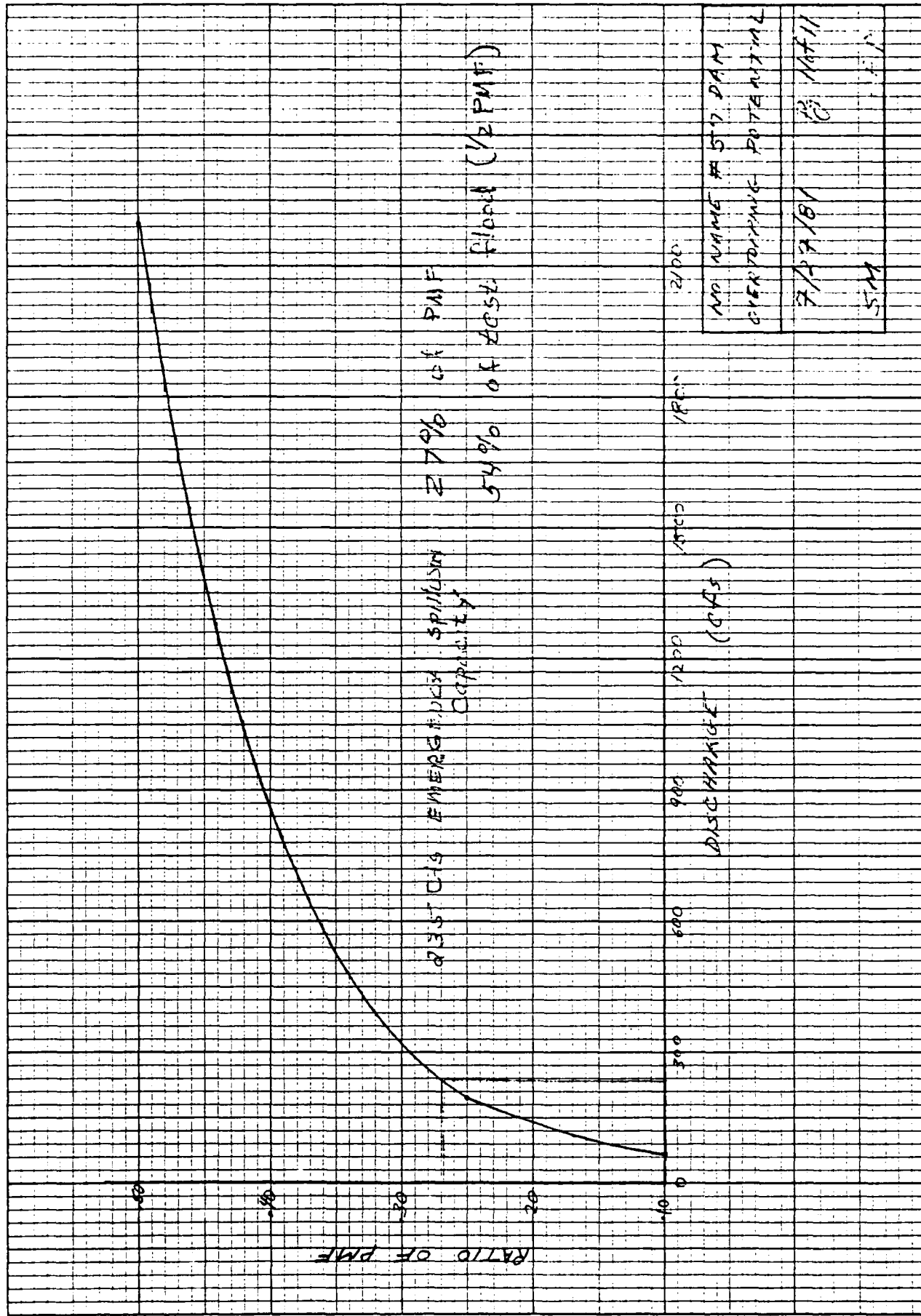
NO NAME #51 DAM

STAGE/STORAGE CURVE

7/27/81 SM

1390511





NO	NAME #57 DAM
OVERFLOWING	POTENTIAL
7/29/81	13 11/11
5.11	1.1

APPENDIX 4

HEC-1 OUTPUT

NO NAME #57 DAM

 * U.S. ARMY CORPS OF ENGINEERS *
 * THE HYDROLOGIC ENGINEERING CENTER *
 * 609 SECOND STREET *
 * DAVIS, CALIFORNIA 95616 *
 * (916) 440-3285 OR (FIS) 448-3285 *

AD NAME 57 DAM 826 ANALYSIS A-NECO INC##
 A-JE-25.0 MULTIPLES OF PPF FROM 24-HOUR SMP
 OF PPF FROM 24-HOUR SMP
 OF UPPER FRESHOLD
 PREACH ANALYSIS

```

$ 10
      OUTPUT CONTROL VARIABLES
      IPLOT      2
      IPLOT      2
      QSCALE     0
      CMSC       YES
      PRINT CONTROL
      PLOT CONTROL
      HYDROGRAPH PLOT SCALE
      PRINT DIAGNOSTIC MESSAGES

```

HYDROGRAPH TIME DATA		MINUTES IN COMPUTATION INTERVAL	
MINUTE	1	0	STARTING TIME
11.15	1 000	0	STARTING TIME
11.20	2 300	0	NUMBER OF HYDROGRAPH ORDINATES
11.25	2 005	0	ENDING TIME
11.30			ENDING TIME

COMPUTATION INTERVAL	0.08 HOURS
TOTAL TIME DASE	24.92 HOURS

ENGLISH UNITS
CAPACITY AREA DEPTH
LENGTH ELEVATION
FORAGE VOLUME
TEMPERATURE

SQUARE MILES
CUBIC FEET PER SECOND
ACRES-FOOT
DEGREES FAHRENHEIT

JP	MULTI-PLAN: OPTION NPLAN	2 NUMBER OF PLANS
JR	MULTI-RATIO OPTION RATIOS OF RUNOFF 0.10 0.25 0.50	

```
0 K.          A1              NO NAME #57
*****
```

COMPUTATION-EXPONENTIAL LOSS RATE

SCS UNIT GRAPH

IO BA	SURFASIN CHARACTERISTICS TAREA	0.20	SURBASIN AREA
100	100	100	100
200	200	200	200
300	300	300	300
400	400	400	400
500	500	500	500
600	600	600	600
700	700	700	700
800	800	800	800
900	900	900	900
1000	1000	1000	1000

PRECIPITATION DATA

12 PM	PROBABLE MAXIMUM STOP#	INDEX PRECIPITATION
P.S.	23	0
TRNSC	0.69	TRANSPCIPITATION COEFFICIENT
TRNSC	0.20	TRANSPCIPITATION AREA
TRNSC	0.20	TRANSPCIPITATION USE
TRNSC	0.20	TRANSPCIPITATION USE SHD OSTRIBUTION

13 LU	UNIFORM LOSS RATE	1.00	INITIAL LOSS RATE
	STILL	0.10	UNIFORM LOSS RATE
	CSTL	0.0	PERCENT IMPROVISED AREA
	RTMP		

	5.	17.	55.	43	UNIT HYDROGRAPH	
	110.	106.	73.	83.	END-OF-PERIOD COORDINATES	
	19.	116.	91.	59.		
	.	132.	13.	9.		
			12.	11.		
				1.		
				7.		
				148.		
				125.		
				140.		
				6.		
				1.		

HYDROGRAPH AT STATION A1

[illegible]


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CUM F    TIME
(CFS)    (MS)
1000.    16.25

(CFS)    6-HR    MAXIMUM AVERAGE FLOW    24-HR    24-HR
(INCHES) 623.    24-HR    72-HR    113.
(CUMUL) 19,504. 21,903. 21,407. 21,907
(CUMUL) 216.    234.    234.    234.

CUMULATIVE AREA = 0.20 SQ MI
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PEAK FLOW (CFS) 500.	TIME (HR) 16.25	6-HR 112.2 (CFS) 9.682 (INCHES) 105.	MAXIMUM AVERAGE FLOW 24-HR 72-HR 50 57 10.953 117.	24.92-HR 57 10.953 117.
CUMULATIVE AREA =			0.20 SQ MI	

ALL ARE SAME AS FOR PLAN 1

ROUTE INFLOW HYDROGRAPH THROUGH POND

HYDROGRAPH ROUTING DATA

STORAGE ROUTING
LSTYP
KSVRIC

1	NUMBER OF SUBREACHES
STOR	TYPE OF INITIAL CONDITION
102.40	INITIAL CONDITION
0.0	WORKING R AND Q COEFFICIENT

	STORAGE	0.0	102.4	111.0	118.0	130.0	134.0	137.0
17 SV	ELEVATION	57.60	72.20	72.70	73.10	73.80	74.00	74.20
19 S2	DISCHARGE	0.	0.	63.	235.	1344.	1808.	2315.
20 SE	ELEVATION	57.60	72.20	72.70	73.10	73.80	74.00	74.20

SPILLWAY	CREST	SPILLWAY	CREST ELEVATION
SPILLWAY	72.30	SPILLWAY WIDTH	
SPILLWAY	132.00	WEIR COEFFICIENT	
SPILLWAY	1.50	EXPONENT OF HEAD	

TOP OF DAM	73.10	ELEVATION AT TOP OF DAM
TYPE LOG	486.00 <th>CANAL WIDTH</th>	CANAL WIDTH
DAM LOG	0.0 <th>WEIGHT COEFFICIENT</th>	WEIGHT COEFFICIENT
EXP	1.50 <th>WEIGHTMENT OF HEAD</th>	WEIGHTMENT OF HEAD

BRACH DATA	57.60	ELEVATION AT BOTTOM OF BRACH
BLWD	80.00	WIDTH OF BRACH BOTTOM
BRWD	1.00	BRACH SIDE SLOPE
Z	1.00	TIME FOR BRACH TO DEVELOP
TRAIL	90.00	W.S. ELEVATION TO TRIGGER FAIL
FAILE		

STORAGE	0.0	102.40	111.00	116.00	130.00	134.00	137.00
OUTFLOW	0.0	0.0	83.00	235.00	1344.00	1608.00	2315.00
COMPUTED STORAGE-OUTFLOW CURVE							

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A2

PEAK OUTFLOW IS 482. AT TIME 16.33 HOURS

PEAK FLOW (CFS) 482.	TIME (HR) 16.33	(CFS) (INCHES) (AC-FT)	6-HR 20.1 9.365 100.	MAXIMUM AVERAGE 24-HR 59. 10.897 116.	FLOW 72-HR 50. 10.888 116.	24.92-HR 56. 10.898 116.
PEAK STORAGE (AC-FT) 121.	TIME (HR) 16.33		6-HR 115.	MAXIMUM AVERAGE 24-HR 106.	STORAGE 72-HR 105.	24.92-HR 106.
PEAK STAGE (FEET) 73.26	TIME (HR) 16.33		6-HR 72.93	MAXIMUM AVERAGE 24-HR 72.43	STAGE 72-HR 72.43	24.92-HR 72.43
CUMULATIVE AREA =				0.20 SQ MI		

PLAN 2 FOR STATION A2	ROUTE INFLOW HYDROGRAPH THROUGH PGND
HYDROGRAPH ROUTING DATA	
STORAGE ROUTING	
STOR	NUMBER OF SUBREACHES
102.40	TYPE OF INITIAL CONDITION
0.0	INITIAL CONDITION
	WORKING R AND D COEFFICIENT
STORAGE	
0.0	102.4
	111.0
	118.0
	130.0
	134.0
	137.0
ELEVATION	
57.60	72.20
	72.70
	73.10
	73.60
	74.00
	74.20
DISCHARGE	
0.	0.
	83.
	235.
	1344.
	1806.
	2315.
ELEVATION	
57.60	72.20
	72.70
	73.10
	73.60
	74.00
	74.20
SPILLWAY	
CREL	SPILLWAY CREST ELEVATION
SPWID	SPILLWAY WIDTH
COEF	WEIR COEFFICIENT
EXPW	EXPONENT OF HEAD
72.30	
132.30	
2.50	
1.50	
TOP OF DAM	
73.10	ELEVATION AT TOP OF DAM
486.00	DAM WIDTH
0.0	WEIR COEFFICIENT
1.50	EXPONENT OF HEAD
BREACH DATA	
ELRM	ELEVATION AT BOTTOM OF BREACH
BRWD	WIDTH OF BREACH BOTTOM
TFAIL	BREACH TIME FOR SUCCESS
FAILL	TIME FOR BREACH TO DEVELOP
73.10	M.S. ELEVATION TO TRIGGER FAILURE

STORAGE	COMPUTED STORAGE-OUTFLOW CURVE
0.0	102.40
	111.00
	118.00
	130.00
	134.00
	137.00
OUTFLOW	
0.0	0.0
	83.00
	235.00
	1344.00
	1808.00
	2315.00

CHANNEL ROUTING- MOC PULS-HILL ROAD BRIDGE

HYDROGRAPH ROUTING DATA

STORAGE ROUTING
NSIPS
ITYP
RSVRIC X
1 NUMBER OF SURFACES
STOP INITIAL CONDITION
-1.00 INITIAL CONDITION
5.0 WORKING R AND C COEFFICIENT

NORMAL DEPTH CHANNEL ROUTING
ANCH
ANCH
ANCH
RLENH
SEL
ELMAX
LEFT OVERBANK N-VALUE
MAIN CHANNEL N-VALUE
RIGHT OVERBANK N-VALUE
REACH LENGTH
ENERGY SLOPE
MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

CROSS-SECTION DATA
LEFT OVERBANK
MAIN CHANNEL
RIGHT OVERBANK
ELEVATION
DISTANCE
70.00
0.0
150.00
57.00
484.00
51.00
445.00
515.00
57.00
516.00
700.00
1200.00

STORAGE
143.20
6498.36
51.00
61.00
2.63
199.68
64.38
9902.87
52.00
62.00
5.29
261.84
158.02
14142.65
53.00
63.00
7.98
329.66
377.93
19240.10
54.00
64.00
13.95
402.33
403.16
593.97
25223.62
32124.67
55.00
65.00
16.23
567.16
1111.21
30971.55
56.00
66.00
26.55
657.67
1535.37
40813.43
58.00
68.00
51.93
753.25
2394.24
58005.93
59.00
69.00
52.38
855.70
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0.6 0.7 0.8 0.9 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0 3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9 4.0 4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9 5.0

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המחבר מודה כי אין זה נכון להניח כי כל המדינות החדשות באסיה החדשה הן חדשות. ישנן מדינות רבות אשר הן חדשות, אך ישנן גם מדינות אשר הן ישנות. המחבר מודה כי אין זה נכון להניח כי כל המדינות החדשות באסיה החדשה הן חדשות. ישנן מדינות רבות אשר הן חדשות, אך ישנן גם מדינות אשר הן ישנות.

PEAK FLOW (CFS) (AC-FI)	TIME (HR)	(CFS) (INCHES) (AC-FI)	6-HR 200 9.31 99	MAXIMUM AVERAGE 24-HR 56 10.875 116	FLOW 72-HR 56 10.875 116	24, 92-HR 56 10.875 116
EXG STORAGE (AC-FI)	TIME (HR)		6-HR 5	MAXIMUM AVERAGE 24-HR 2	STORAGE 72-HR 2	24, 92-HR 2
PFV STAGE (CFS) (AC-FI)	TIME (HR)		6-HR 52.93	MAXIMUM AVERAGE 24-HR 51.61	STAGE 72-HR 51.69	24, 92-HR 51.59

CUMULATIVE AREA = 0.20 SC MI

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OFF-PEAK FLOW (CFD)	TIME (HRS)	(CFS) (MGD)	6-HR AVERAGE STORAGE	24-HR AVERAGE STORAGE	MAXIMUM AVERAGE STORAGE	24-HR AVERAGE STORAGE	24-HR AVERAGE STORAGE
1.57	16.92	(CFS) (MGD)	6-HR 41.9 19.429	24-HR 110 20.529	MAXIMUM AVERAGE STORAGE 72-HR 106 20.629	24-HR 106 20.629	24-HR 106 20.629
37	16.92	(CFS) (MGD)	6-HR 9	24-HR 2	MAXIMUM AVERAGE STORAGE 72-HR 2	24-HR 2	24-HR 2
58.40	16.92	(CFS) (MGD)	6-HR 59.68	24-HR 51.75	MAXIMUM AVERAGE STORAGE 72-HR 51.75	24-HR 51.75	24-HR 51.75

CUMULATIVE AREA = 0.20 SQ MI

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS		
				RATIO 1 0.10	RATIO 2 0.25	RATIO 3 0.50
HYDROGRAPH AT	A1	0.20	1	100.	250.	500.
			2	16.25	16.25	16.25
				100.	250.	500.
ROUTED TO	A2	0.20	1	62.	193.	452.
			2	16.25	16.58	16.33
				62.	193.	2195.
			** PEAK STAGES IN FEET **			
			1	72.57	72.99	73.26
			2	16.83	16.58	16.33
ROUTED TO	A3	0.20	1	58.	184.	458.
			2	17.42	16.83	16.50
				58.	184.	1878.
			** PEAK STAGES IN FEET **			
			1	51.90	52.90	54.37
			2	17.42	16.83	16.50
				51.90	52.90	58.40
				17.42	16.53	16.92

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

PLAN 1

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	ELEVATION SURFACE OUTFLOW	MAXIMUM DEPTH OVER DAM	INITIAL VALUE 72.20 102. 0.	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TOP OF DAM 73.10 118. 235.	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	72.57	72.57	0.0	109.	62.	0.0	0.0	16.43	16.43	0.0
0.25	73.09	73.09	0.0	116.	193.	0.0	0.0	16.58	16.58	0.0
0.50	73.26	73.26	0.16	121.	482.	1.50	1.50	16.53	16.53	0.0

PLAN 2

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	ELEVATION SURFACE OUTFLOW	MAXIMUM DEPTH OVER DAM	INITIAL VALUE 72.20 102. 0.	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TOP OF DAM 73.10 118. 235.	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	72.57	72.57	0.0	109.	62.	0.0	0.0	16.43	16.43	0.0
0.25	73.09	73.09	0.0	116.	193.	0.0	0.0	16.58	16.58	0.0
0.50	73.17	73.17	0.07	119.	2198.	0.33	0.33	16.52	16.52	15.92

NORMAL END OF JOB ***

APPENDIX 5
REFERENCES

NO NAME #57 DAM

APPENDIX 5
REFERENCES

NO NAME #57 DAM

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